



Materials Engineering Branch

TIP*



No. 029 Cleanliness of Gases Used for Flight Hardware

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A number of different gases are used in connection with space flight hardware. Some of them are employed for purging, some for propulsion or for attitude control and some for maintaining a particular environment on the ground or in orbit in some experiments. Most engineers and technicians who are responsible for procuring these gases are aware of the need to specify high purity products. Unfortunately, specifying high purity alone is not a sufficient guarantee of a satisfactory end product

Unless the customer specifically requires a chemical analysis of the actual tank of gas that is delivered to him/her, the analysis given by the manufacturer is usually that of the gas in the production plant. Ordinarily, no effort is made to clean tank interiors so that the cleanliness of a particular tank of gas should be considered suspect. In addition, the delivery system through which the gas is transferred may be a source of contamination and should be factored into any consideration of the final cleanliness of the gas.

The delivery system of a high purity gas must not, in itself, be a source of contamination. Only the most inert materials should be chosen for the delivery system. Suitable materials are stainless steel, Teflon, polypropylene and polyethylene. In some cases properly cleaned Viton can be used.

In spite of the real or potential hazards mentioned in the procurement of a satisfactorily clean gas, there is a rather simple and inexpensive device that can be used in the majority of cases to insure the cleanliness of the gas. The device consists of a small filter packed with molecular sieve 5A, followed by a particulate filter of about 5 micron pore size¹ that could be installed at the delivery end of the system. This filter device is capable of removing small amounts of non-volatile oils, moisture and particulates.

An alternative technique, to the use of a filter, is a mass spectroscopic analysis of the gas or weighing the residue from liquid nitrogen trapped gas sample taken at the end of the purge system.

¹ Stainless steel, Teflon or polypropylene membrane.